

**BIOLOGICAL OBSERVATIONS ON
CHRYSOMYA MEGACEPHALA (FABR.)
(DIPTERA: CALLIPHORIDAE) IN LOS ANGELES,
CALIFORNIA AND THE PALAU ISLANDS**

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Abstract.—In 1988 and 1989, specimens of the Oriental latrine fly, *Chrysomya megacephala* (Fabr.) were collected in urban Los Angeles, California. It was evident in summer through autumn, 1988, and reappeared in summer, 1989. Earlier collections and observations of *C. megacephala* were recorded in 1986 in the Palau Islands. In rural Palau, the males were rarely seen in inhabited areas except during dawn swarming activities, but in Los Angeles, the males were found in ornamental vegetation in the urban habitat. The origin of *C. megacephala* in California is unknown but may be via the Pacific Islands or Mexico.

Key Words.—Insecta, Diptera, Calliphoridae, Oriental latrine fly, biology, California, Palau Islands

The Oriental latrine fly, *Chrysomya megacephala* (Fabr.) is a widely distributed filth fly in the Old World, occurring in the warmer areas of the Oriental and Australian regions as well as the eastern Palaearctic (M. Lacey, personal communication). In recent decades, *C. megacephala* has expanded its range to Africa, becoming established in South Africa, Madagascar, Senegal, Ghana and presumably Angola (Prins 1982, do Prado & Guimaraes 1982, Peris 1987). This filth fly arrived in the New World at São Paulo, Brazil, around 1975 and has since spread to Argentina, Paraguay, Venezuela and southern Mexico, where it was collected in 1986 (Baumgartner 1988). It is also found on many afrotropical, Caribbean and Pacific islands, including Hawaii (Bohart & Gressitt 1951, Smith 1986). Townsend reported that *C. megacephala* does not occur in North America (Cole 1969); however, it was recently discovered in California in 1988 (Dowell & Gill, 1989), confirming the Mexican records of its spread to North America. Because *C. megacephala* is a known carrier of *Salmonella* and other enteric pathogens, polio virus (Baumgartner & Greenberg 1984) and infectious stages of parasitic roundworms, pinworms and hookworms (Sulaiman et al. 1988), it is necessary to closely monitor its northern expansion in North America. Our report of the activity of *C. megacephala* in urban Los Angeles documents this expansion. In addition, our observations on *C. megacephala* in the temperate, urban habitat of Los Angeles and the rural, tropical habitat of a Pacific island may provide insights into understanding the ability of *C. megacephala* to colonize such widely diverse environments.

OBSERVATIONS

California.—The first record for *C. megacephala* in Los Angeles County was 6 Aug 1988 (CDFA 1988, Poorbaugh 1989) from a landfill at Scholl Canyon in the foothills of the San Gabriel Mountains, north of metropolitan Los Angeles. On

12 Aug 1988, we discovered a large number of *C. megacephala* adults in an urban area within walking distance (approx. 1.5 km SW) of the high-rise building complex of downtown Los Angeles. From August through October, 1988, we collected over 100 *C. megacephala* within a square block of the Pico-Union district of Los Angeles. The specimens were collected by netting at various attractive sites in the area. Adults of *C. megacephala* were attracted to outdoor garbage disposal bins containing decomposed seafoods (shrimp, fish or squid), rotten watermelon and other discarded foodstuffs. *Chrysomya megacephala* was also observed on animal and human excrement. Collections at these sites yielded mostly females, although occasionally males were also collected in 1988. All blowfly activity, including *C. megacephala*, appeared to cease with the onset of cooler weather in later October, 1988.

We monitored the area for *C. megacephala* throughout the winter months of 1988–1989 but found no activity until 25 Apr 1989 when a single female was captured. Two additional females were collected on 27 and 28 Apr respectively but no other *C. megacephala* adults were found, until July, 1989 despite daily monitoring. On 7 Jul 1989, *C. megacephala* adults were again observed at a disposal bin and in a dense growth of ivy and other vines that was covering a 2 m fence in the collection area. Sweep netting of the dense vegetation yielded three males and a female of *C. megacephala*. Subsequent collecting by sweep netting this vegetation (not sampled in 1988) has consistently yielded males. The numbers of *C. megacephala* in the area continued to increase throughout August, 1989, approaching the levels observed in 1988.

Our observations in Los Angeles are consistent with previously reported observations of *C. megacephala* elsewhere. In temperate South Africa, *C. megacephala* was also found to be most common in the late summer and early autumn (Prins 1982). The preference of males for areas with shady vegetation has also been noted in India, except in that country the vegetation consisted of uninhabited jungle (Roy & Dasgupta 1978). The known ability of *C. megacephala* to survive in mild temperate climates such as that of southern California (Baumgartner & Greenberg 1984) combined with our recent observations over a full year indicate that Los Angeles is a suitable area for this fly.

Palau. — The Palau Archipelago (Republic of Belau) is a compact cluster of high and low islands at the western end of the Caroline Islands in the western equatorial Pacific Ocean. During a collection trip in July, 1986, over 40 *C. megacephala* were collected on the high island of Babelthaup in Palau. Most of the specimens collected were attracted to containers of discarded fish entrails in a small village of approximately 200 inhabitants. Fly specimens collected at attractive sites in the village included 39 females and 2 males. The fly was observed entering houses and was also attracted to outhouses and swine enclosures, although in smaller numbers than observed for the containers of fish entrails. Numerous collecting trips to adjacent agricultural, jungle and grass land areas failed to find *C. megacephala* by netting and sweep netting of vegetation. No *C. megacephala* were present in the repository insect collection maintained by the Palau Ministry of Agriculture, specimens of which may be an indication of the relative economic/public health importance of this fly in Palau. (Bohart and others deposited approx. 500 *C. megacephala* at the California Academy of Sciences, Golden Gate Park, including specimens from Guam, Philippines, Solomons, New Hebrides, Oahu,

Maui, and Kauai, but none were from Palau.) Palau exhibits a remarkably low apparent number of filth flies compared to other tropical areas. This may be accounted for by good sanitation which limits the number of available breeding sites. In Palau, sewage disposal is modern, buildings are usually screened, refuse is disposed in sanitary landfills and health education is pervasive. Combined with the rural nature of Palauan settlements, these sanitation practices definitely limit the abundance of synanthropic flies such as *C. megacephala*.

In the village on Babelthaupt, *C. megacephala* was observed in a dawn swarming activity that occurred regularly on clear, sunny mornings between 06:00–07:00 h during July, 1986. The aerial swarm gathered over a single, large lawned area in the village and consisted of approximately 100 flies. The swarm members hovered in stationary positions that varied from about 3 m to 9 m above the ground and were well separated from all vegetation that bordered the lawn. Swarm members spaced themselves about 1 m apart, horizontally and vertically, and readily challenged each other if their spacing was encroached upon. Intruders from outside the swarm were observed crossing through the swarm on a diagonally downward trajectory. These intruders, presumed to be *C. megacephala* females, were each pursued by several swarm members as they crossed the swarm. An audible buzzing sound accompanied the swarm throughout its daily duration of about 1 h. A single male *C. megacephala* was netted from the lower levels of a swarm. Local residents report that this swarming activity occurs frequently throughout the year. In the Palauan language, *C. megacephala* is called “debulliaes” or “iaesidebull,” both terms meaning “graveyard fly.”

Collection Records.—Because it is relevant in quantitatively characterizing *C. megacephala* in invasive situations, we list the following collection data: PALAU ISLANDS. Ngaremlengui: 3 Jul 1986, 39 females, 3 males (one in swarm). USA. CALIFORNIA. LOS ANGELES Co.: Los Angeles, 12 Aug 1988, 1 female; *ibid.*, 1 Sep–15 Oct 1988, 80 individuals (unsorted); *ibid.*, 22 Oct 1988, 20 females, 1 male; *ibid.*, 23 Oct 1988, 1 female; *ibid.*, 25 Apr 1989, 1 female; *ibid.*, 27 Apr 1989, 1 female; *ibid.*, 28 Apr 1989, 1 female; *ibid.*, 7 Jul 1989, 1 female, 3 males; *ibid.*, 11 Jul 1989, 2 females, 1 male; *ibid.*, 24 Jul 1989, 1 female, 1 male; *ibid.*, 26 Jul 1989, 1 male; *ibid.*, 26–27 Jul 1989, 6 females; *ibid.*, 2 Aug 1989, 2 females, 2 males; *ibid.*, 7 Aug 1989, 3 females; *ibid.*, 14 Aug 1989, 1 male; *ibid.*, 15 Aug 1989, 6 females, 4 males.

DISCUSSION

The degree of dependence of *C. megacephala* on urban habitats has been discussed before by a number of dipterists. In Brazil, *C. megacephala* was assigned a synanthropic index (a measurement showing degree of dependence on cohabitation with humans) of +75.2 (do Prado & Guimaraes 1982), although in India, the index was calculated as +91.6 (Roy and Dasgupta 1978) or very highly dependent on human settlements. The synanthropic index was developed to gauge degree of synanthropy of a species and ranges from +100 to –100 (do Prado & Guimaraes 1982). Although having a high index value *C. megacephala* can also occur in rural areas exclusive of those occupied by man. On Guam, and on the Solomon Islands, *C. megacephala* is successful in uninhabited beach habitats, where it breeds in carcasses of toads and crabs (Bohart & Gressitt 1951). In Palau,

where no urban habitat exists, it was found in a rural setting. While *C. megacephala* may thrive best in densely populated urban areas, such as Los Angeles, it also can adapt to other habitats and its occurrence at the relatively isolated Scholl Canyon site north of Los Angeles may be an indication of an ability to survive in less densely populated suburban or rural areas adjacent to the urban centers of southern North America.

Whether in a rural or urban setting, it is important to recognize the significance of behavioral differences between *C. megacephala* males and females. Males are often more difficult to locate than females because the males are not as attracted to refuse and excrement. The known preference of males for shady vegetation (Roy & Dasgupta 1978) was expressed at our urban collection area by an apparent preference for ornamental ivy and other urban vegetation. In Palau, the attractive sites for males were not found but the swarming activity gave an indication of the probable extent of the male contingent. In both Los Angeles and Palau, our observations confirm that site attractiveness is different for males and females of *C. megacephala*. Failure to locate the attractive sites for one of the sexes could cause inaccurate estimations of population levels of *C. megacephala* in an area and may also affect the efficacy of control measures that need to be applied if this fly becomes a serious public health pest locally.

The probable origin of the first recorded *C. megacephala* in California is either Mexico (Dowell & Gill 1989) or Hawaii (CDFA 1988). Lacking geographic barriers it was thought inevitable that *C. megacephala* would expand northwards through Mexico into the United States (Baumgartner & Greenberg 1984). However, this is not the only possible route of invasion. The urban area where we collected *C. megacephala* is inhabited by recent immigrants from both Central America and Asia. New immigrants from Asia frequently pass through Hawaii, where *C. megacephala* also occurs, and it is possible that the fly may have been alternatively introduced from the Pacific islands. A Pacific route of expansion has been postulated for other species of *Chrysomya* (do Prado & Guimaraes 1982) and Hawaii is recognized as a staging area for the introduction of exotic insects into California (Dowell & Gill 1989). The sites of Mexican records for *C. megacephala* are remote, separated from the United States border by long distances across arid desert barriers such as from the southern tip of Baja, California (Greenberg 1988). In a large, culturally diverse urban center like Los Angeles, multiple routes of invasion are possible for *C. megacephala* but without extensive records of interceptions at entry ports, it will be impossible to identify the true origins of *C. megacephala* expansion into California.

We conclude that *C. megacephala* has become established in the Los Angeles area. Our collection records over a one year period coupled with our other observations show that the population in the Pico-Union district of Los Angeles is typical of other established populations in mild temperate climates. The route by which *C. megacephala* expanded its range into this area is unknown but it can be expected that *C. megacephala* will continue to expand to other areas in the Los Angeles basin, possibly to include suburban and semi-rural communities. Comparing observations in the urban Los Angeles habitat and the Palauan tropical habitat, we found that *C. megacephala* males occur in ornamental vegetation in Los Angeles, but in Palau the males were generally absent from inhabited areas except when swarming at dawn.

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